

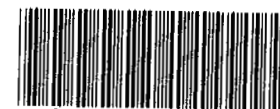


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July 28, 1994

S. R. Grace  
Manager  
OU1, OU2 Program  
DOE, RFFO

QUARTERLY REPORT SUBMITTAL FOR THE OPERABLE UNIT NO. 2 (OU-2) FIELD  
TREATABILITY UNIT - MCB-215-94

Enclosed are copies of the OU-2 FTU 1994 second quarterly report. The quarterly report fulfills an external milestone in work package 12050. Please forward copies to the Colorado Department of Health and the Environmental Protection Agency.

If you have any questions please contact Ty Vess at extension 6540.

*MC Broussard for*

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# **QUARTERLY REPORT**

**FOR APRIL THROUGH JUNE 1994**

**OPERABLE UNIT 2  
IM/IRA SURFACE WATER  
FIELD TREATABILITY UNIT**

**PREPARED BY**



**ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE  
ENVIRONMENTAL RESTORATION PROGRAM DIVISION  
ENVIRONMENTAL OPERATIONS MANAGEMENT**

**July 28, 1994  
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**Quarterly Operations Report for April Through June 1994**  
**at the**  
**Operable Unit No. 2 IM/IRA Field Treatability Unit**

## **1.0 INTRODUCTION**

This report covers operations at the Operable Unit Number 2 (OU-2) Field Treatability Unit (FTU) for the second quarter of 1994.

The FTU is being operated as an Interim Measure/Interim Remedial Action (IM/IRA) under the Plan released by the Department of Energy (DOE) on May 8, 1991. The FTU began operation as Phase I for treatment of surface water from a portion of the South Walnut Creek drainage at OU-2 for removal of volatile organic compounds (VOCs) of concern. The Phase I system consisted of collection facilities at Surface Water locations SW59 and SW61, equalization tankage, bag pre-filters, Granular Activated Carbon (GAC) treatment units and insulated, heat traced transfer piping, pumps, and controls. Phase I was conducted between May 13, 1991 and April 27, 1992, at which time the Radionuclides Removal System (RRS) and collection of SW132 was implemented under the Phase II program. The RRS added provisions for treatment of radionuclides and metals by pH adjustment, chemical precipitation and cross-flow membrane filtration. The RRS replaced bag pre-filters as pretreatment to the GAC system. Detailed descriptions of the FTU and its operation can be found in the IM/IRAP (Interim Measure/Interim Remedial Action Plan), the Sampling and Analysis Plan (SAP), and related documentation. The Field Treatability Study, Phase II (March 1994) for the South Walnut Creek Basin Surface Water Interim Measure/Interim Remedial Action report contains a detailed operating history of the FTU prior to this reporting period.

## **2.0 TREATMENT FACILITY PERFORMANCE**

### **2.1 QUANTITY OF WATER TREATED**

A total of 1,826,420 gallons of water were treated at the FTU during this reporting period.

The FTU was designed to collect surface water from three sources; SW59, SW61, and SW132. Collection occurs twenty four hours per day, 375 days per year. Collected water is stored in a ten thousand gallon double walled equalization tank until enough water is present to justify initiating a batch treatment.

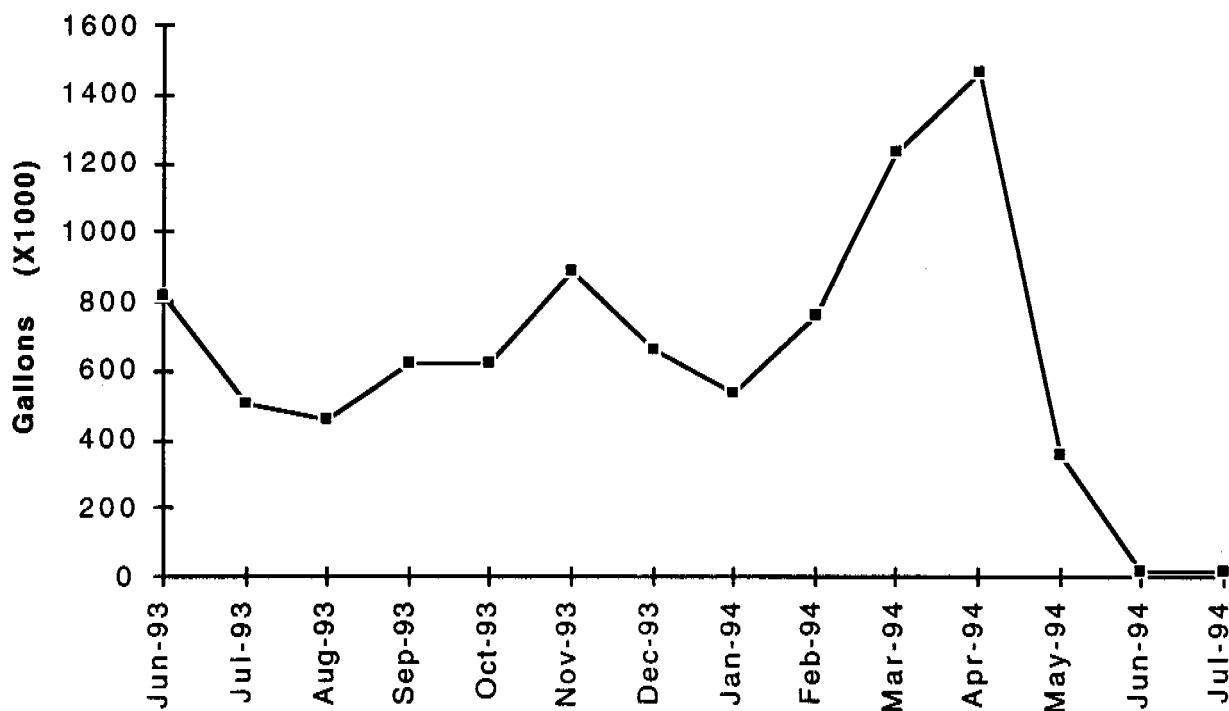
Collection of SW61 and SW132 was discontinued on May 6, 1994, after the Colorado Department of Health (CDH) and Environmental Protection Agency (EPA) concurred with DOE's

request to discontinue collection and treatment of these sources. While previous sampling has shown contamination at the two sites below Applicable or Relevant and Appropriate Requirement (ARAR) levels, the two sources will continue to be sampled to verify that no increase in contamination is present. Quarterly sample data for SW61 and SW132 will be presented in this report and future quarterly reports. Table 1 contains ARARs for the OU-2 FTU.

The significant reduction in the volume of treated water at the FTU is presented in Graph 1. Graph 1 also indicates the excess capacity available at the facility since collection and treatment of SW61 and SW132 is no longer required.

**GRAPH 1**

**Treated water per month at the OU-2 FTU**



**TABLE 1**  
**Surface Water Contaminants**  
**Identified in the South Walnut Creek Basin IM/IRAP<sup>1,2</sup>**

<u>Analyte</u>	<u>Unit</u>	<u>Average Concentration</u>	<u>ARAR</u>
<b>Radionuclides</b>			
Am-241	pCi/l	0.53	0.05
Gross alpha	pCi/l	730.00	11.00
Gross beta	pCi/l	545.00	19.00
PU-239/240	pCi/l	3.28	0.05
U-total	pCi/l	11.69	10.00
<b>VOCs<sup>3</sup></b>			
1,1-Dichloroethene	µg/l	142	7.00
Carbon Tetrachloride	µg/l	219	5.00
Chloroform	µg/l	82	1.00
Tetrachloroethene	µg/l	279	1.00
Trichloroethene	µg/l	153	5.00
Vinyl Chloride	µg/l	-	2.00
<b>Metals-Dissolved</b>			
Iron	µg/l	-	300.00
Manganese	µg/l	0.5790	50.00
<b>Metals-Total</b>			
Aluminum	µg/l	25.1214	200.00
Arsenic	µg/l	-	50.00
Barium	µg/l	1.8530	1,000.
Beryllium	µg/l	0.0519	100.00
Cadmium	µg/l	0.0132	5.00
Chromium	µg/l	0.1918	10.00
Copper	µg/l	0.2664	25.00
Iron	µg/l	183.964	1,000.
Lead	µg/l	0.1954	5.00
Manganese	µg/l	3.3068	1,000.
Mercury	µg/l	0.0022	0.20
Nickel	µg/l	0.2239	40.00
Selenium	µg/l	0.0070	10.00
Zinc	µg/l	1.3475	50.00

<sup>1</sup> From the IM/IRAP (DOE, 1991).

<sup>2</sup> Only analytes with ARARs are presented.

<sup>3</sup> Analyzed by EPA Method 524.2.

- Not calculated in the IM/IRAP.

The volume of water collected for treatment during this reporting period was as follows:

	<u>Location</u>	<u>Month Total</u>	<u>Daily Average</u>	<u>Gallons per Min.</u>
April	SW59	71,839 gal	2,395 gal	1.66
	SW61,132	1,096,571 gal	36,552 gal	25.38
May	SW59	51,954 gal	1,676 gal	1.16
	SW61,132*	187,040 gal	31,173 gal	21.65
June	SW59	54,017 gal	1,800 gal	1.25
	SW61,132	0 gal	0 gal	0

- \* Collection and treatment of SW61 and SW132 was discontinued on May 6, 1994. Daily averages and gallons per minute are calculated from May 1, 1994 through May 6, 1994.

During high precipitation events, it was not uncommon for the flows at SW61 and SW132 to exceed the 60 gallon per minute collection rate. All water in excess of 60 gallons per minute was allowed to overflow the collection weirs.

All water from SW59 is collected for treatment, including high precipitation events.

## 2.2 CHEMICAL USAGE

Chemical usage at the FTU was as follows:

<u>Month</u>	<u>Sulfuric Acid</u>	<u>Calcium Hydroxide</u>	<u>Ferric Sulfate</u>	<u>H<sub>2</sub>O<sub>2</sub></u>	<u>Sodium Hydrox.</u>
April	232 gallons	1,922 lbs	541 lbs	185 gallons	495 gallons
May	131 gallons	1,360 lbs	307 lbs	138 gallons	165 gallons
June	0* gallons	22 lbs	0* lbs	15 gallons	55 gallons

- \* Sulfuric acid and ferric sulfate usage is recorded as 0 gallons and pounds respectively due to the small volume of water processed. These chemicals were used at normal concentrations, but preparation of chemicals was not required during the month.

A total of 220 gallons of sodium hypochlorite was used during this quarter to clean the microfiltration membranes.



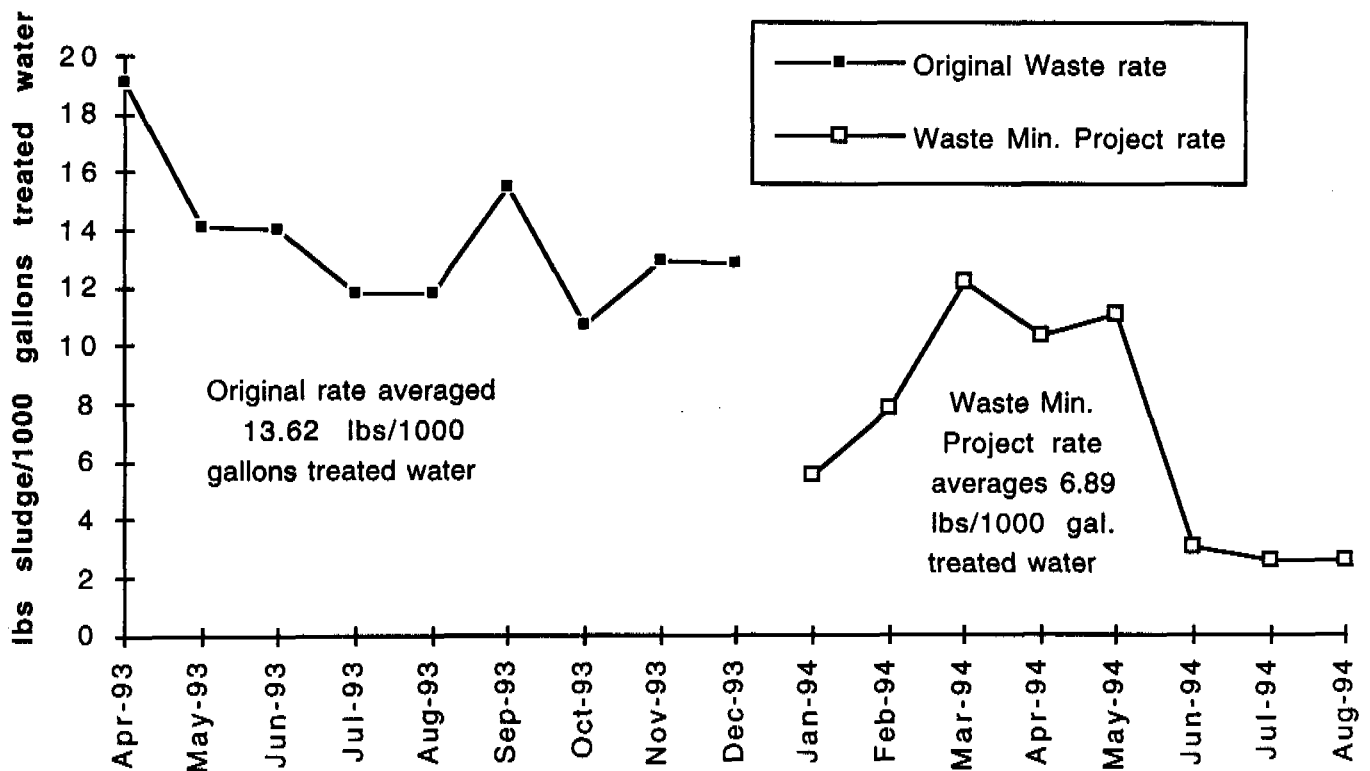
## 2.3 WASTE GENERATION

Two GAC vessels (2000 lbs GAC each, 4000 lbs total) were used during this period. The additional carbon usage can be attributed to the increased contaminant loading from the Soil Vapor Extraction (SVE) extracted groundwater. Two batches of SVE water were treated at the FTU during this reporting period. The spent GAC was sampled and will be sent offsite (along with all spent GAC from Phase II operations) for reactivation.

The sludge generated at the OU-2 FTU is handled and packaged as low-level radioactive mixed waste. An EPA waste code of F001 requires the mixed waste determination. While sample results indicate that hazardous waste contaminants are below acceptable levels, the possible presence of carbon tetrachloride requires the drums to be handled as a mixed waste. A total of thirty-two drums were packaged this quarter. Original sludge (waste) generation rates and the new reduced sludge generation rate (implemented the last week of December, 1993) are displayed in Graph 2 (below).

**GRAPH 2**

### OU-2 FTU Waste Minimization

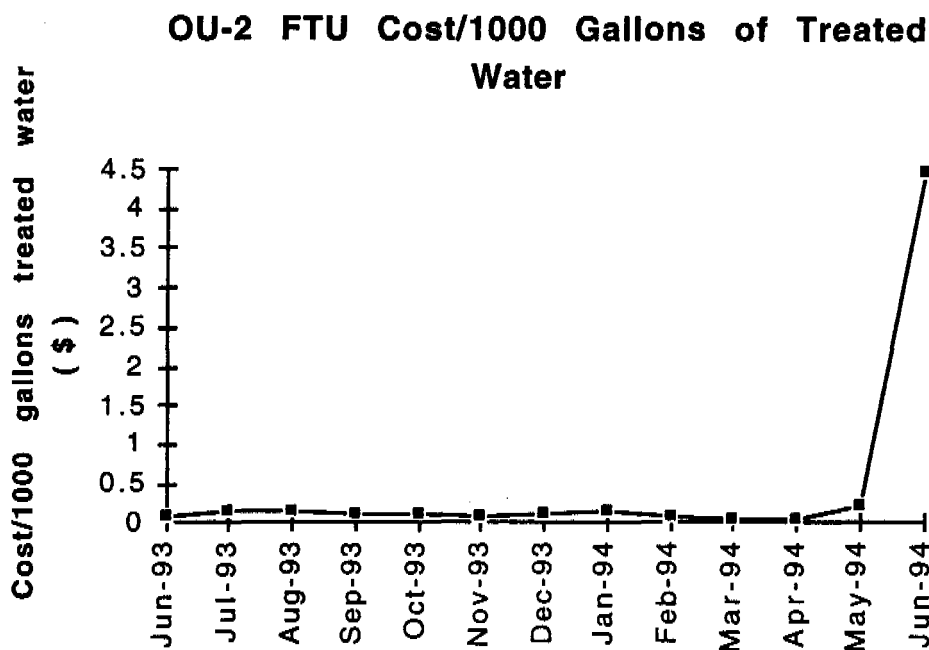


Approximately two 55-gallon bags of Personnel Protective Equipment (PPE) are generated per month, with three bags generated during this quarter. The PPE is monitored for contaminants, and if determined clean for unrestricted release, sent to the Rocky Flats Plant Landfill for disposal. To date, no PPE has been found to be contaminated.

## 2.4 OPERATING COSTS

The reduced volume of water that is collected and treated at the FTU has resulted in cost savings for sampling and chemical supplies. Modifications to reduce the subcontractors contract began soon after collection and treatment of SW61 and SW132 was discontinued, but will not be in effect until August, 1994. The cost/1000 gallons of treated water at the FTU is presented in Graph 3, below. Increased treatment costs/1000 gallons of treated water can be attributed to the reduction in treated water. Other sources of water or another source of treatment for SW59 are being investigated in order to reduce these costs.

**GRAPH 3**



Operations and maintenance (O&M) of the FTU is performed by Resource Technologies Group, Inc. (RTG), a subcontractor under the Master Task Subcontract (MTS) system. By utilizing subcontract labor, EG&G is able to operate the FTU at a significantly lower cost, while still

providing qualified personnel. Average burdened labor costs for EG&G operators is approximately \$95/hour, whereas subcontract labor for O&M averages \$40/hour. MTS subcontractors bring many years operating experience on similar systems, and must complete the same training as EG&G personnel. The EG&G FTU project manager oversees all of the FTUs operations, and provides input into the operations of the unit.

Monthly operating costs for subcontractor labor and supplies (including chemicals) were as follows:

April:	\$84,430
May:	\$77,433
June:	\$66,987

## **2.5 POWER**

Power for the FTU was provided by portable diesel generators throughout this quarter. Construction of permanent power for the facility began on April 15, 1994, and was approximately 95% complete at the end of this quarter. Permanent power replaced diesel power generation on July 8, 1994.

Backup power is provided to the FTU from a portable diesel generator that is wired into the power grid through a transfer switch. In the event of a power failure, the diesel generator will provide 100% of the power required to operate the facility.

## **2.6 PREVENTIVE MAINTENANCE**

During this reporting period a rigorous preventive maintenance program monitored all process equipment at the FTU. All process equipment at the FTU has been characterized and evaluated for preventive maintenance frequency, spare parts requirements, and impacts on the system from individual equipment failure. A preventive maintenance computer program tracks all planned maintenance activities and helps to assure that all equipment is properly maintained.

Decreased collection and treatment of water has resulted in increased time to perform maintenance. All corrective and preventive maintenance that could be performed was completed during this reporting period. Additionally, annual painting and minor operational improvements were performed.

All corrective and preventive maintenance items are complete and on schedule.

## **2.7 PERIODS OF NON-COLLECTION**

Periods of non-collection are periods when the collection weir pumps cannot collect surface water (up to 60 gallons per minute) and transfer it to the equalization tank for storage and

later treatment. Periods of non-collection for this reporting quarter were as follows:

<u>Date</u>	<u>Duration</u>	<u>Cause</u>
4/10/94	57 min	Membrane cleaning required.
4/11/94	20 min	Membrane cleaning required.
4/12/94	1 hr 35 min	Membrane cleaning required.
4/13/94	6 hr 0 min	Membrane cleaning required.
4/14/94	50 min	Planned power outage.
4/16/94	12 hr 22 min	Extended membrane cleaning performed.
4/28/94	2 hr 55 min	SW-61 pump failure.
4/29/94	11 hr 50 min	Extended membrane cleaning performed.

No periods of non-collection have occurred since collection of SW-61 and SW-132 was discontinued on May 6, 1994.

### 3.0 SAMPLING

#### 3.1 SAMPLING OBJECTIVES

Sampling at the FTU is performed to characterize the influent surface water, wastes, and effluent water, and to optimize FTU operations to minimize chemical consumption and waste generation. The Interim Remedial Action Plan (IRAP) identified specific contaminants of concern and established possible chemical-specific ARARs as effluent standards for discharge of the treated water (ref. Table 1, page 5).

Preliminary sample results showing contaminants exceeding ARARs are presented below, as well as contaminants not associated with ARARs that are present in the water stream above detection levels.

Due to the significant decrease in the volume of collected and treated water, sampling at the FTU has been reduced significantly. Treated effluent (sample location RS-7) is sampled during each treatment cycle.

Surface Water Division continues to characterize the three sampling locations (SW59, SW61, and SW132) associated with the FTU. Analytical results will be presented in quarterly reports for the facility.

Sample results contained in this report are unvalidated, and are presented to provide a general scope of the contaminants treated at the facility. Additionally, radionuclide data turnaround time is significantly longer than that of VOC or metals. Radionuclide data is presented for the *previous* quarterly report.

### 3.2.1 UNTREATED INFLUENT WATER FROM SW59

<u>Chemical</u>	<u>Units</u>	<u>High</u>	<u>Average</u> <sup>1</sup>	<u>ARAR</u>	<u>%Samples&gt;ARAR</u>
<b>VOCs</b>					
1,1-Dichloroethane	ug/l	3	1.5	-	N/A
1,1-Dichloroethene	ug/l	4	2.5	7.00	0%
1,1,1-Trichloroethane	ug/l	13	7.6	-	N/A
Carbon Tetrachloride	ug/l	110	76.8	5.00	100%
Chloroform	ug/l	22	15.1	1.00	100%
Tetrachloroethene	ug/l	62	44.8	1.00	100%
Trichloroethene	ug/l	63	46.8	5.00	100%
cis-1,2-Dichloroethene	ug/l	56	37.8	-	N/A
Methylene Chloride	ug/l	7	0.82	-	N/A
<b>Metals</b>					
Cadmium	ug/l	20.5	5.1	5	14%
Zinc	ug/l	121	89.8	50.0	100%

#### **Radionuclides**

Radionuclide data was not received for this reporting period prior to preparation of this report.

No radionuclide samples exceeded ARAR values at SW59 during the first quarter of 1994.

<sup>1</sup> Average value calculated by taking all values (for non-detect, 1/2 the detection limit was used) and dividing the value by the number of samples.

### 3.2.2 SURFACE WATER LOCATION SW61

<u>Chemical</u>	<u>Units</u>	<u>High</u>	<u>Average</u> <sup>1</sup>	<u>ARAR</u>	<u>%Samples&gt;ARAR</u>
<b>VOCs</b>					
Carbon Tetrachloride	ug/l	15	9.6	5.00	90%
Chloroform	ug/l	2	1.5	1.00	100%
Tetrachloroethene	ug/l	20	12.1	1.00	100%
Trichloroethene	ug/l	20	11.9	5.00	90%
<b>Metals</b>					
Cadmium	ug/l	13.5	4.6	5	29%
Manganese (dissolved)	ug/l	80.5	30.9	50.0	43%

#### **Radionuclides**

Radionuclide data was not received for this reporting period prior to preparation of this report.

Gross Beta was observed at 45 pCi/l (ARAR=19 pCi/l) on January 13, 1994. This was the

only radionuclide that exceeded ARARs at SW61 during the first quarter of 1994.

- <sup>1</sup> Average value calculated by taking all values (for non-detect, 1/2 the detection limit was used) and dividing the value by the number of samples.

### 3.2.3 SURFACE WATER LOCATION SW132

No VOCs exceeded ARARs at SW132 during this reporting period.

<b>Metals</b>	<b>Units</b>	<b>High</b>	<b>Average<sup>1</sup></b>	<b>ARAR</b>	<b>%Samples&gt;ARAR</b>
Manganese (dissolved)	ug/l	56.2	45.1	50	50%
Zinc	ug/l	51.0	13.7	50	16%

#### **Radionuclides**

Radionuclide data was not received for this reporting period prior to preparation of this report. First quarter radionuclide results for SW-132 were as follows:

<b>Radionuclide</b>	<b>Units</b>	<b>High</b>	<b>Average<sup>1</sup></b>	<b>ARAR</b>	<b>%Samples&gt;ARAR</b>
Uranium, Total	pCi/l	14	9.9	10	42%
Americium-241	pCi/l	0.12	0.02	0.05	8%
Plutonium-239/240	pCi/l	0.12	0.02	0.05	8%

- <sup>1</sup> Average value calculated by taking all values (for non-detect, 1/2 the detection limit was used) and dividing the value by the number of samples.

### 3.3 RS-5 (TREATED EFFLUENT FROM CHEMICAL PRECIPITATION/MICROFILTRATION PRIOR TO GAC)

Analysis of the received sample data for this quarter indicates that no ARARs were exceeded for metals at this sample point, with the exception of mercury, which had a value of 0.21 ug/l (detection = 0.20 ug/l) on April 26, 1994. Radionuclide data have not been received for this reporting period.

VOCs exceeded ARAR values at the RS-5 sampling location, as expected. The RS-5 sample location is located upstream of the GAC system, which removes the VOCs from the water stream.

No radionuclide ARARs were exceeded at this sampling location during the first quarter of 1994.

### 3.4 RS-6 (LEAD GAC EFFLUENT)

The GAC was monitored for VOC breakthrough (effluent of lead GAC exceeding ARAR level for any compound) after the lead unit. When breakthrough is achieved, the old polish unit becomes the

lead unit, and a new (virgin) unit becomes the polish. Typically, chloroform is the compound that breaks through and exceeds ARARs first. Chloroform's low affinity for GAC and low ARAR (1.0 ug/l) make it a somewhat difficult compound to remove from the water stream. Monitoring for breakthrough will continue to assure that the GAC units are fully utilized prior to replacement.

### **3.5 RS-7 (TREATED EFFLUENT)**

No ARAR values were exceeded for VOCs or metals at the discharge point RS-7 for the FTU during the second quarter of 1994, with the exception of cadmium at 11.5 ug/l (ARAR = 5 ug/l) and zinc at 104 ug/l (ARAR = 50 ug/l) on June 2, 1994. Radionuclide data for this reporting period have not been received.

No radionuclide ARARs were exceeded at this sampling location during the first quarter of 1994.

### **3.6 RS-8 (SLUDGE)**

Preliminary data indicates that VOC samples for the sludge taken during this sample period contain chloroform. Metals analysis indicate the presence of barium in some of the sludge samples. Radionuclide data for this reporting period have not been received. Due to process knowledge, all sludge generated at the FTU is packaged as low-level mixed waste. EPA waste code F001 (spent chlorinated solvents) has been determined to be the appropriate waste code for characterizing.

## **4.0 OPERATIONS SUMMARY**

Two batches of water collected from the OU-2 Vapor Extraction Unit were treated at the OU-2 FTU. The water was sampled to assure that it was compatible with the FTU's treatment capabilities. Sampling indicated that the FTU effectively removed contaminants to below ARAR levels.

A sludge reduction program was initiated during the last week of December, 1993. This program has reduced the amount of sludge generated at the FTU by approximately 50%. The sludge reduction was accomplished by using 25% sodium hydroxide (liquid) to control the pH in the second reaction tank (TK-2) and reducing the amount of calcium hydroxide (lime) injected into the tank. Six months of operation indicate no adverse affects, and preliminary indications show a sludge reduction of approximately 50% by volume. Efforts will continue to reduce waste generated at the FTU.

Continued monitoring and backwashing of GAC is resulting in decreased carbon usage.

Implementation of Conduct of Operations continues at the FTU.

The two extended chemical cleaning cycles performed on the microfiltration membranes proved to be very successful. Over the two years of operations, a slight decrease in microfiltration capacity has been observed, resulting in re-occurring periods of non-collection. The increased chemical soak was able to remove residual deposits from the membrane surface that were not being removed during normal chemical cleaning cycles. Flow through the microfiltration unit is now in excess of 130 gallons per minute, with a sustainable flow near 80 gallons per minute.

## **5.0 ENVIRONMENTAL COMPLIANCE**

On June 22, 1994 the diesel generator providing power to the FTU spilled an estimated one to two gallons of motor oil onto the ground. The oil and affected soil were removed by the Hazardous Materials Response Team.

## **6.0 REPORTS/CORRESPONDENCE**

During this reporting period, the following significant reports and/or documents that pertained to the OU-2 FTU were generated:

Letter dated April 28, 1994, from the EPA and CDH to DOE authorizing discontinuing of collection and treatment of SW61 and SW132.

Letter dated May 6, 1994 from DOE to EG&G Rocky Flats Environmental Restoration Management, directing EG&G to discontinue collection and treatment of SW-61 and SW132.

EG&G Value Engineering Study submitted to DOE on May 13, 1994, regarding collection and treatment of SW59.

## **7.0 ANTICIPATED OPERATIONS FOR NEXT QUARTER**

Normal operations are expected to continue next quarter, with no expected shutdowns.

Any groundwater extracted from the SVE project will be treated at the FTU.

Modifications will be made to the sampling and analysis plan for the FTU. A net reduction in samples, along with onsite analysis of other samples will result in a significant cost savings.

A modification to the current operations and maintenance subcontractor's contract will be made to significantly reduce the operations cost at the facility. Hours of operation will be reduced from 24-hours per day, seven days per week to 40-hours per week. Collection of SW59 will continue 24-hours per day, seven days per week.



Purge water collected from contaminated wells may be treated at the FTU. All purge water will be sampled to determine the best facility to treat the water. Possibilities for treatment include the OU-1 IM/IRA (Bldg. 891), OU-2 IM/IRA FTU, 374 Evaporator, and the Sewage Treatment Plant. Each facility is limited by certain contaminants, so sampling would determine the final destination.

Plans will be made to transport all of the Phase II spent GAC offsite for reactivation.

Alternate uses for the FTU will be discussed and presented to DOE and the regulatory agencies. Since the facility now has excess capacity, significant cost savings could be achieved from utilizing the FTU to treat contaminated water from OU-2 or other sites.

Upgrades to the facility that would allow the FTU to treat higher levels of contamination will be investigated during the next quarter.

Sampling and characterization of SW61 and SW132 will continue.

## **8.0 SUMMARY/CONCLUSIONS**

The OU-2 FTU continues to collect and treat contaminated surface water from SW59 24-hours per day, 375-days per year. Process improvements have reduced both operating costs and generated hazardous waste. Waste reduction, chemical use reduction, and treatment facility optimization will continue to be explored and implemented in order to make the FTU a more efficient operation.